HAINING PAN

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EDUCATION

Ph.D. University of Maryland, College Park, Physics — Aug. 2017 to now
Advisor: Sankar Das Sarma
PhD candidate

B.Sc. Nanjing University, Physics — Sept. 2013-Jun. 2017
B.Eng. Nanjing University, Computer Science — Sept. 2013- Jun. 2017

RESEARCH INTEREST

- Topological quantum computing
- Strongly correlated system
- Topological phases of matter
- Machine learning

RESEARCH EXPERIENCE

Majorana zero modes in semiconductor-superconductor nanowires 2017 to now

- Simulate the transport properties of nanowire in the presence of disorder
- Use the random matrix to simulate zero-bias peaks in class D ensemble

Twisted bilayer 2019 to now

- Construct an extended Hubbard model and Heisenberg model in twisted bilayer
- Discover a field-tunable Dzyaloshinskii–Moriya interaction in the system
- Discover rich quantum phase diagrams at various fractional filling factors
- Predict a platform for realizing quantum anomalous Hall effect and spin liquid

PUBLICATIONS

Pan, H., and Das Sarma, S, "Disorder effects on Majorana zero modes: Kitaev chain versus semiconductor nanowire" arXiv:2012.12904 (2020)

Pan, H., and Das Sarma, S, "Interaction-driven filling-induced metal-insulator transitions in 2D moiré lattices" arXiv:2012.04554 (2020)

Pan, **H**., Sau, J.D., and Das Sarma, S., "Three-terminal nonlocal conductance in Majorana nanowires: distinguishing topological and trivial in realistic systems with disorder and inhomogeneous potential" arXiv:2009.11809 (2020)

Pan, H., Wu, F. and Das Sarma, S, "Quantum Phase Diagram of a Moiré-Hubbard model" Phys. Rev. B 102, 201104(R) (2020)

Pan, H., Wu, F. and Das Sarma, S, "Band topology, Hubbard model, Heisenberg model, and Dzyaloshinskii-Moriya interaction in twisted bilayer WSe_2" Physical Review Research 2, 033087 (2020)

Pan, H. and Das Sarma, S, "Physical mechanisms for zero-bias conductance peaks in Majorana nanowires" Physical Review Research 2 (1), 013377 (2020)

Pan, H., Cole, W.S., Sau, J.D. and Das Sarma, S., "Generic quantized zero-bias conductance peaks in superconductor-semiconductor hybrid structures" Physical Review B 101 (2), 024506. (2020)

Pan, **H**., Sau, J.D., Stanescu, T. and Das Sarma, S., "Curvature of gap closing features and the extraction of Majorana nanowire parameters" Physical Review B 99 (5), 054507. (2019)

Pan, **H**., Winkler, K., Powlowski, M., et al and Kim, N. Y.., "Two-kind boson mixture honeycomb Hamiltonian of Bloch exciton-polaritons" Physical Review B 99 (4), 045302 (2019)

Sett, A, **Pan**, **H**., Falloon, P.E. and Wang, J.B., "Zero transfer in continuous-time quantum walks" Quantum Information Processing 18 (5), 159. (2019)

Huang, Y, **Pan**, **H**., Liu, CX., Sau, J.D., Stanescu, T. and Das Sarma, S., "Metamorphosis of Andreev bound states into Majorana bound states in pristine nanowires" Physical Review B 99 (5), 054507. (2018)

PROFESSIONAL SERVICE

Peer-Reviewed Articles for:

- Physical Review B
- Physical Review Letter
- Physical Review X

COMPUTER SKILLS

Programming: MATLAB, Mathematica, Python, C++, Shell Script, Julia, ASM, Pascal

Platforms & Packages: Slurm, Linux, PyTorch

HONORS AND FELLOWSHIP

KITP Graduate Fellowship, Spring 2021
First tier Dean Fellowship by University of Maryland, 2018-2019 &2017-2018
China National Scholarship, top 0.1% undergraduate, 2015

REFERENCES

Dr. Sankar Das Sarma,
Condensed Matter Theory Center, University of Maryland
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Dr. Jay Deep Sau,
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